

**Introduction to Chemistry**  
**EXIT COMPETENCIES**  
**One Semester Course**  
**February 4, 2008**

**I. The Scientific Method. The student should:**

- A. Know that science is a process.
- B. Know that science is based on observations made in the physical world (data).
- C. Know that hypotheses are made based on these observations.
- D. Know that hypotheses are tested creating new data and probably new hypotheses.
- E. Know that Laws are summary statements of a large number observations.
- F. Know that Theories are statements that explain observations and predict future observations.
- G. Know that Theories and Laws are subject to change; that Theories and Laws must be supported by the data.

**II: Atoms and the Periodic Table. The student should be able to:**

- A. Apply appropriate units to express various measurements.
- B. Use the method of dimensional analysis to systematically convert from one unit to another.
- C. Understand the Law of Conservation of mass and energy.
- D. Quantify the three fundamental particles in any atom, isotope, or ion.
- E. Apply the significance of the electron configuration within an atom or ion and the position of an element on the periodic table.

**III: Compounds, Formulas, Reactions, and Equations. The student should be able to:**

- A. Classify elemental, ionic, and covalent substances and relate a systematic name to a formula.
- B. Recognize various reaction types and construct a balanced equation describing the formation of products from reactants.
- C. Use a periodic table and a balanced chemical equation to convert (reversibly) between mass to moles of a substance and mole to mole conversions for various changes.
- D. Apply the concept of limiting reactants and the nature of chemical analysis.
- E. Construct working Lewis structures for simple covalent compounds. Classify types of chemical bonding.

**IV: Behavior of the States of Matter. The student should be able to:**

- A. Understand the kinetic-molecular theory which explains the behavior of gases.
- B. Relate the effect of pressure, volume, temperature, or amount changes as stated by the Ideal Gas Equation.
- C. Recognize the nature of intermolecular forces of attraction and their effect on the physical properties of substances.

- D. Predict Hydrogen Bonding and the unique physical properties it manifests in water and other biomolecules.
- E. Determine the energy transfer involved with varying temperature and changes in state using measured conversion factors.

**V: Properties of Solutions. The student should be able to:**

- A. Understand the intermolecular forces involved in the action of solvation of an ionic or covalent solute.
- B. Use dimensional analysis to systematically convert from one unit to any other with concentration units as a connection.
- C. Understand and use the concepts of mass percent, parts per million, molarity, molality, and mole fraction.
- D. Translate a chemical change in a solution into a net ionic equation which discounts the presence of spectator ions.
- E. Characterize the simple action of acids and bases and the nature of the pH scale.

**VI: Equilibrium, and Oxidation and Reduction. The student should be able to:**

- A. Understand that chemical reactions go to an equilibrium state.
- B. Assign the oxidation states for each element within a formula.
- C. Identify oxidation and reduction reactions.
- D. Identify oxidizing agents and reducing agents.